U. S. DEPARTMENT OF AGRICULTURE
FARMERS' BULLETIN No. 1295

WHAT TRACTORS *and* HORSES DO *on* Corn-Belt Farms

The following series of six bulletins has been prepared under the direction of the committee on farm power, appointed by the Secretary of Agriculture, to represent the Bureau of Agricultural Economics, Bureau of Public Roads, and the Bureau of Animal Industry in a cooperative study of all phases of the farm power problem:

Farmers' Bulletin 1295: What Tractors and Horses Do on Corn-Belt Farms.

Farmers' Bulletin 1296: Changes Effected by Tractors on Corn-Belt Farms.

Farmers' Bulletin 1297: Cost of Using Tractors on Corn-Belt Farms.

Farmers' Bulletin 1298: Cost of Using Horses on Corn-Belt Farms.

Farmers' Bulletin 1299: Shall I Buy a Tractor? (For a Corn-Belt Farm.)

Farmers' Bulletin 1300: Choosing a Tractor. (For a Corn-Belt Farm.)

This bulletin, which is No. 1 of the series, discusses the adaptability, inadaptability, and reliability of the tractor and horses for the different farm operations and the form of power most commonly used for each by farmers who already own tractors.

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Washington, D. C. January, 1923

WHAT TRACTORS AND HORSES DO ON CORN-BELT FARMS.

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CONTENTS.

PRACTICALLY every Corn-Belt farmer has a general idea as to what a tractor will do, but the particular operations that a certain tractor will perform efficiently and profitably are not usually known by the man who does not own a machine. Even farmers who already own tractors can not always decide definitely whether to use their machines or continue to use their horses for a given operation.

The amount and kind of work which should be done with the tractor and with horses, respectively, depend on the organization of the farm. For some operations it will be found more satisfactory to use horses exclusively; for others the tractor; and for still others, both. Some operations may be performed with the one or the other as a matter of convenience rather than of profitableness. It is, therefore, a difficult problem to fit the tractor and horses into the operation of a farm so as to obtain the maximum benefits from the ownership of each.

This bulletin discusses the relative adaptability of tractors and horses to work on Corn-Belt farms under both favorable and unfavorable conditions: their relative reliability, and the choice of power for specific farm operations. Suggestions are given which should be of assistance to men who do not now own tractors in deciding as to the operations for which they could profitably use such machines, and to tractor owners in determining more definitely which jobs should be done with tractors and which with horses.

ADAPTABILITY OF THE DIFFERENT FORMS OF POWER.

Prior to the advent of the tractor, horses (or draft animals of some kind) were used for all farm operations where tractive power was required. Since there was no other form of power, there was no basis for comparison. But now that the tractor has come into common use on Corn-Belt farms a comparison can be drawn between the two forms of power for different drawbar operations.

While the tractor has many advantages for some classes of work, there are many operations for which horses are better suited than the tractor. On some farms conditions exist which prevent the

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will necessitate the other standing idle, it will perhaps be advisable to use horses in most instances.

The proportion of different kinds of work done with horses and with tractors, respectively (expressed in terms of days of horse labor required), on 286 Corn-Belt farms with tractors in Ohio, Indiana, and Illinois in 1920 is shown in Figure 1.[4] On these farms the tractors did 85 per cent of the plowing, 66 per cent of the fitting ground other than plowing, 8 per cent of the haying, 41 per cent of the cutting of grain, and a small per cent of other operations. On these same farms the horses did practically all of the seeding, corn cultivating, and harvesting, manure hauling, and miscellaneous work, the remaining 5 per cent or less being done by the tractor. Altogether the tractors did 30 per cent and the horses 70 per cent of the drawbar work as measured by days of horse labor required for it. The tractors did most of the heavy work of plowing and fitting ground, and if it had been possible to measure the work done by the tractors and work stock in terms of drawbar pull and distance trav-

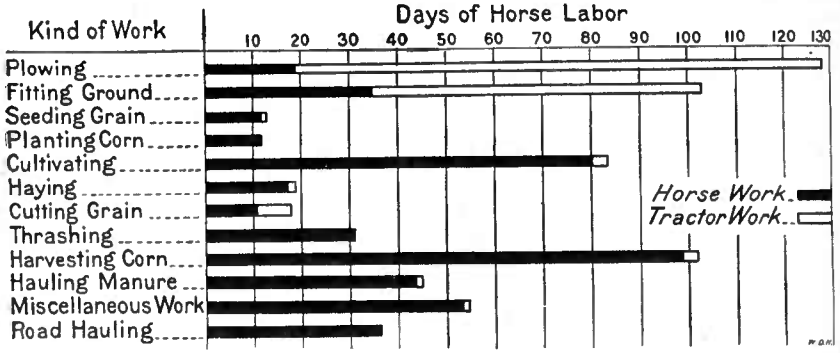

FIG. 1.—Proportion of different kinds of work done with horses and tractors.

eled, the proportion of the total done by the tractors would have been considerably greater.

The number of operators of the same farms who used tractors exclusively, horses exclusively, or both for different operations, is shown in Table 1. Only those operations where the two forms of power compete to any extent are shown, all others being performed almost exclusively with horses.

TABLE 1.—*Number of operators who use tractors exclusively, horses exclusively, or both, for various operations (286 farms).*

Operation.	Number who used—			Number not performing operation.
	Tractor only.	Horses only.	Tractor and horses.	
Spring plowing	142	4	121	19
Fall plowing	190	8	27	61
Disking	84	55	69	78
Disking in combination	164	.....	.....	122
Harrow or in combination	27	148	30	81
Drilling grain	7	166	9	104
Cultivating corn	2	270	14	.....
Haying	.....	190	37	59
Cutting grain	108	149	22	7
Harvesting corn	.....	268	18	.....

[4] U. S. Department of Agriculture, Bulletin 997, page 35.

The uses which these men made of their tractors are discussed below and suggestions are given which should enable other tractor owners or prospective owners to make an intelligent choice of power for specific operations on their own farms.

PLOWING.

Every one of the 286 farmers in question used his tractor for either spring or fall plowing. Over half of those who did spring plowing did it all with their tractors, and more than four-fifths who did fall plowing did it all with their tractors. (See Fig. 2.)

With some makes of tractors it is impracticable or impossible to finish up the ends and corners of the field, making it necessary to use horses for this work. Where there is more than one man on a

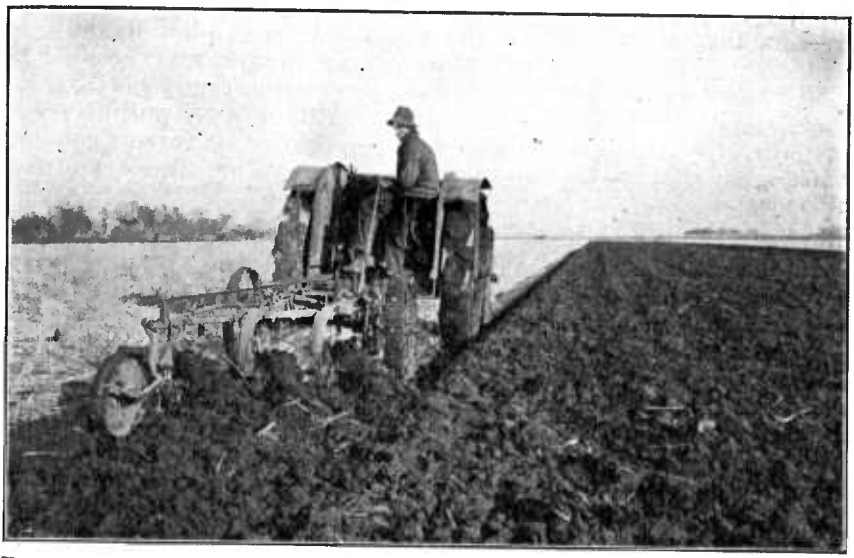

FIG. 2.—Tractors are used more for plowing than for any other operations on Corn-Belt farms.

farm it will be more economical to use both tractor and horses for plowing at the same time rather than have men and horses idle.

In years when the spring is unfavorable, farmers without tractors often have to hire plowing done in order to get their crops planted in time. A late season always causes a rush of work in a short period. With a tractor on the farm it is ordinarily unnecessary to hire such outside labor, as the machine can be run day and night if necessary, and the land prepared in less time than would be required to do all the work with horses. However, the plowing that can be done with a tractor at day work, perhaps supplemented by horses, will be sufficient in most cases to offset a late season. Whenever possible the horses on the farm should be used at the same time as the tractor to hurry the plowing along.

It may be practically impossible to do satisfactory plowing with horses in a season when the soil becomes baked and hard, owing to

extreme drought. The tractor has frequently shown its ability to do plowing of this kind.

For example, on the western edge of the Corn Belt, where considerable winter wheat is raised and where the late summer is sometimes very hot and dry, farmers who own tractors can plow their land in spite of the baking of the soil. It will then be ready to plant as soon as there is sufficient moisture. Those who depend entirely upon horses are forced to wait until it rains before they can plow and prepare their land. A similar condition may present itself at any time in other sections.

On some farms there is a certain amount of heavy, sticky soil, which is difficult to plow with horses, and the fields with such soil are most frequently used as permanent pastures. Sometimes the tractor can be used to advantage in breaking up such land.

Some farmers think it desirable occasionally to plow a field to a slightly greater depth than usual, and bring to the surface a thin layer of the subsoil. If the practice has been to plow to the same depth year after year the bottom of the furrow may be so hard as to make it impossible to go any deeper with ordinary horse-drawn plows. With the heavier tractor plow and the greater pulling power of the tractor it will be possible to plow below this furrow sole and break up the hard layer which at times prevents moisture from passing through.

On some Corn-Belt farms stumpy, stony, or rooty ground may still be found. Also there may be some land with a growth of underbrush and small trees. The tractor will plow such land in a satisfactory manner because of its great tractive power and because heavier plows are used which withstand shocks and strain better than does horse equipment. In underbrush it may not be necessary first to clear the land before starting the work.

In fields where there are numerous soft spots horses will almost always prove more satisfactory than a wheeled tractor for plowing, as the tractor may bog down owing to its weight, thus entailing a great deal of trouble and delay. Bogging down usually happens when the load is heavy and the ground is not firm enough to hold the wheels from slipping. The same thing will often happen when wheeled types of tractors are worked in very sandy soils.

On some farms there are certain types of soil on which it has been found that the tractor does not do satisfactory work because of the tendency to pack the soil even when it is in a condition favorable for plowing. When a condition such as this exists it is always advisable to use the horses.

DISKING, HARROWING, PLANKING, ROLLING, AND PACKING.

Figure 1 shows that 66 per cent of fitting the ground other than plowing was done with tractors by the farmers in question, and Table 1 shows that a large part of this work done with tractors consisted of pulling disks, either alone or in combination with light implements. (See Fig. 3.) Horses were never used by these men for disking in combination, as the largest teams which they used could not pull such loads.

Every farmer realizes that disking is a hard operation for horses to perform, and tractor owners relieve them of this work whenever

possible. A smaller percentage of operators use their machines exclusively for disking, however, than for plowing. Some operators prefer to use their horses on freshly plowed or moist ground rather than to run the risk of packing the soil with the tractor, and on some large farms horses are used for disking while the tractor is being used simultaneously for plowing.

Ordinarily the heavier tractor disks are capable of better soil preparation than are horse-drawn disks. With the tractor and a tandem disk, once over the land in nearly every instance will be sufficient to put it in the proper condition for dragging and planting. The tractor is commonly used for preparing for winter wheat land which was previously in corn. The corn is first cut and shocked and then the land is disked with the tractor, the horses following

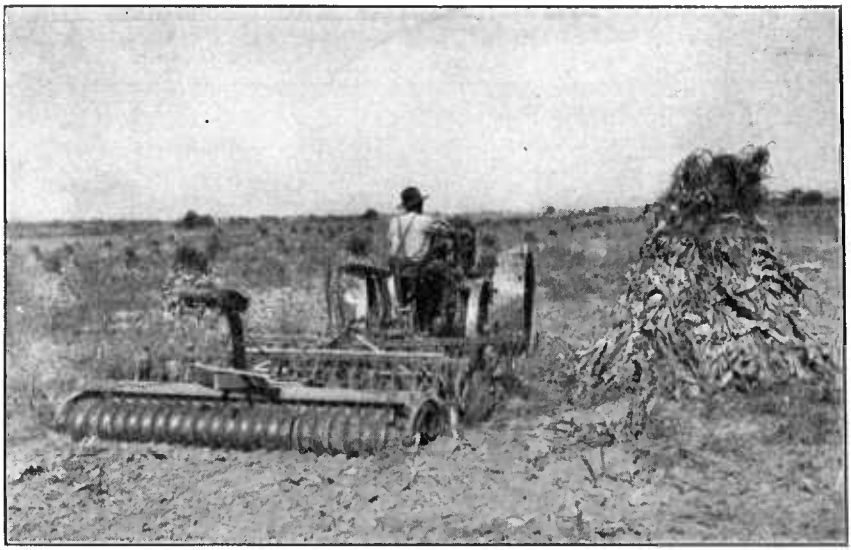

FIG. 3.—Tractor drawing a double disk and packer on an Ohio farm.

with the drill. Where oats follow corn the tractor and disk are used to break down the stalks and prepare the land, which is then sowed with an end-gate seeder drawn by horses.

Fifty-seven per cent of the 286 men mentioned above used their machines exclusively for disking and 95 per cent used them for a part of the work. This would seem to indicate that the tractor can be used to advantage for disking on most Corn-Belt farms.

While there are some farms where it is not practicable to use the tractor on plowed ground, it is a common practice on some farms operated by one man alone to prepare the land from plowing to seeding entirely with the tractor. After the ground has been plowed the work of further preparation may be done at one operation instead of several, as when horses are used. Thirty-nine of the 286 men used their tractors for all of their plowing and fitting ground prior to planting and for any disking and harrowing after planting.

Since harrowing alone is a light operation, it will usually be advisable to use horses for this work when all of the preparation

between plowing and seeding is not done with the tractor at one operation. Nearly three-fourths of the men who used harrows or other light implements alone during the year used horses exclusively for pulling them.

SEEDING GRAIN.

Horses are used almost exclusively for seeding small grain on Corn-Belt farms, only a very few men using their tractors for this work. (See Fig. 4.) The tractor is not satisfactory where end-gate seeders are used, and on drills the horses will usually furnish the power more economically. The tractor could pull two or three drills at one time, but the ordinary farm in this region is not large enough to warrant the ownership of more than one drill. Never-

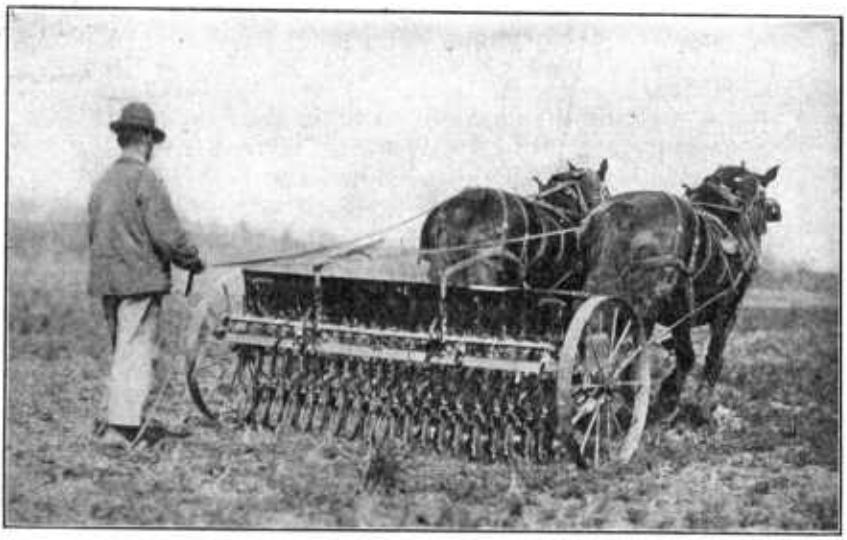

FIG. 4.—On most farms horses will furnish the power for seeding more economically than will tractors.

theless on one-man farms perhaps more seeding is done with tractors than on the farms where there are two or more men. Only 5 per cent of the men on the 286 farms did any drilling with their tractors.

PLANTING AND CULTIVATING CORN.

Every one of the 286 men planted his corn with horses, and only 16 used their tractors for any of the work of cultivation. (See Fig. 5.) Where the cultivating is done with a tractor the general purpose type is the one most commonly used. The same difficulty will be experienced with a tractor as with a two-row horse-drawn outfit in cultivating the first time over or in cultivating crosswise when the rows are crooked. Some difficulty may be experienced in turning, owing to the size of the machine as compared with the space available at the ends of the fields. The outfit should be capable of so turning that it will not break down the growing plants at the ends of the rows. With the ordinary wheeled type of machine the difficulty

of obtaining a satisfactory hitch for the cultivator, the insufficient clearance, and difficulty of turning at the ends of the row make it unsatisfactory for this purpose. The motor cultivator, however, which is designed especially for cultivating corn rather than for general farm work, will usually perform this operation in a satisfactory manner.

HAYING.

The small acreage in hay on the ordinary farm in the Corn Belt will ordinarily be handled more cheaply with horses than with a tractor, except possibly where the tractor is used for pulling the wagon and loader. Thirty-seven of the 286 men used their machines for pulling a wagon and loader.

In another investigation of the use of tractor and horses made in seven Corn-Belt States in 1918, and reported in Farmers' Bulletin 1093, it was found that 12 per cent of the operators interviewed used

FIG. 5.—Corn cultivation represents the peak load of horse labor on farms where tractors are owned.

their machines for pulling the wagon and loader. While this is not a common practice, the practicability of using the tractor for this work has been demonstrated sufficiently in the past perhaps to warrant others in using their machines for haying.

Infrequently two hay loaders and wagons are pulled, but only where there is a large crop of hay and they can be handled efficiently is it possible to use such a combination. Now and then the machine is hooked on the hay rope and the hay fork or slings pulled up into the mow. Some operators use their machines for cutting hay, pulling one or two mowers. Neither of these practices will ordinarily be profitable when horses are available. (See Fig. 6.)

HARVESTING GRAIN.

Table 1 shows that nearly half of the tractors in question were used for cutting grain. There have been times in the experience of

many farmers when speed in the harvest field would have prevented the partial or even total loss of a given crop. By placing the heavy load on the tractor at such times, work can be carried on without delay and such possible loss averted, especially in extremely hot

FIG. 6.—Horses are used almost entirely for haying on Corn-Belt farms.

weather. Overheating and resultant death of horses has sometimes occurred during the harvest season. One drawback in using a tractor to pull a binder in harvesting is the extra help that is often required. Unless it is possible to operate the tractor by the use of extended controls it will be necessary to have a man on the tractor

and some one on the binder, thus reducing the labor available for shocking. (See Fig. 7.)

To hurry up the harvest when a season has been unfavorable, the tractor can be run continuously day and night, with a double shift, provided heavy dew does not interfere. Where the acreage in small grain is large, and there are two binders on the farm, the horses can be used on one and the tractor on the other, or, if the tractor has sufficient power, both binders may be drawn by the machine. In this case one man will be required on each binder.

HARVESTING CORN.

Horses are used almost exclusively for harvesting corn, the tractor being used only for the mechanical picker and occasionally for the

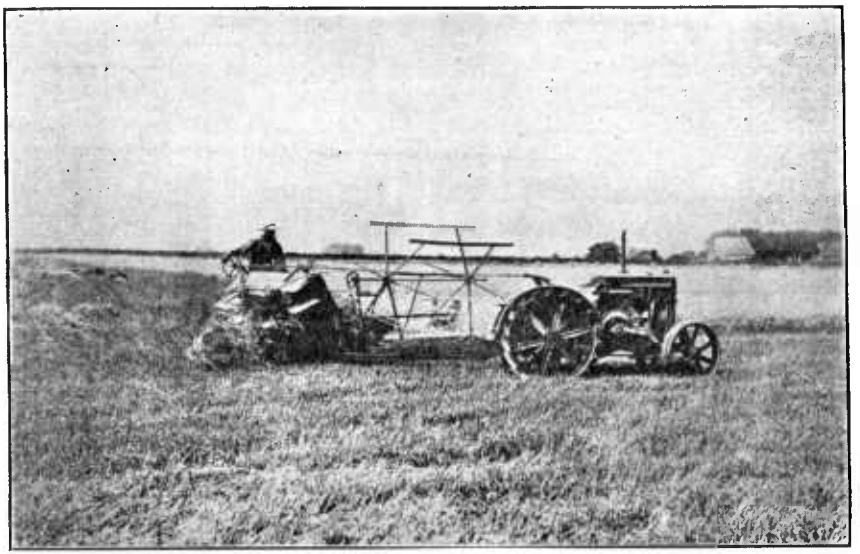

FIG. 7.—One man operating tractor and binder by use of an extended control.

corn binder. Since only three horses are ordinarily required for the corn binder, usually it will not be economical to use the tractor. As mechanical pickers require five or six horses, besides the wagon teams, the tractor will be found satisfactory for use on pickers. Eighteen of the 286 men in question used their tractors for pulling a corn binder or mechanical picker.

OTHER DRAWBAR WORK.

The "other drawbar work" which there is to do on the farm consists mainly of pulling bundle wagons in thrashing, hauling manure, and miscellaneous work of a light nature requiring power units of not more than two horses. Figure 1 shows that practically all of this work was done with horses, and that a comparatively large number of days of horse labor were required for it. In addition, an average of 35 days of horse labor were required for hauling on the road. Not one of the 286 men used his tractor for road hauling. (See Fig. 8.)

For odd jobs requiring a large amount of power the tractor can often be used to advantage. Such work may consist of any of the following: Stretching fences, moving small buildings about the farm,

FIG. 8.—Horses are more satisfactory than a tractor for hauling on the road.

changing the location of feed bunks and racks in the lot or to various parts of the farm, pulling out hedges, stumps, stones, and small trees, and pulling out old posts when it is desired to change a line of fence.

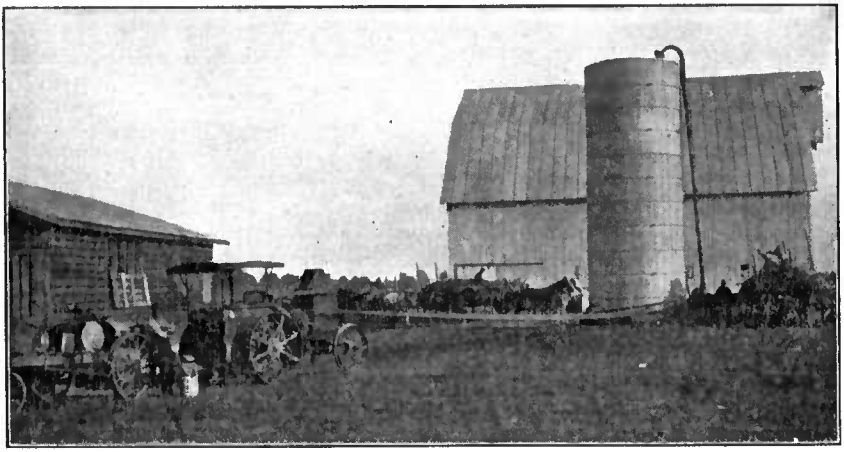

FIG. 9.—The tractor furnishes satisfactory power for nearly all the heavy belt work on Corn-Belt farms.

BELT WORK.

For belt work the tractor is equal to a stationary engine of equal size, and when jobs are to be done in different places on the farm

the ability of the tractor to transport itself to the operations makes it better fitted for the work. Grinding feed, thrashing, filling silos, shredding fodder, and sawing wood are operations that are frequently done with tractors on Corn-Belt farms. (See Fig. 9.)

While some tractor owners use their machines for drawbar work only, others use them for belt work which they formerly hired done. The cost of some of the belt machines for use with the tractor is considerable and the tractor owner must choose between the outlay of cash necessary for their purchase and continuing to hire the work done.

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